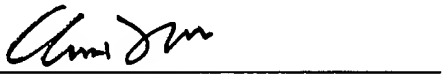
CERTIFICATE OF TRANSLATION

As a below named translator, I hereby declare that my residence and citizenship are as stated below next to my name and I hereby certify that I am conversant with both the English and Korean languages and the document enclosed herewith is a true English translation of the invention Disclosure with respect to the Korean patent application No. 2000-35793 filed on June 27, 2000.

NAME OF THE TRANSLATOR : Ji Hye YOO

SIGNATURE : 

Date : February 21, 2007

RESIDENCE : MIHWA BLDG., 110-2, MYONGRYUN-DONG 4-GA, CHONGRO-GU, SEOUL 110-524, KOREA

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Translation of Priority Document

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This is to certify that annexed hereto is a true copy from the records of the Korean Intellectual Property Office of the following application as filed.

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Applicant(s) : Samsung Electronics Co., Ltd.

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COMMISSIONER

[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

There is provided a method of adapting a mobile telecommunication system to channel conditions. Specifically there is provided a method and apparatus of selectively requesting retransmission of a packet in both a link adaptation scheme and an ARQ (Automatic Repeat reQuest) scheme.

If the reception power of a forward pilot signal is greater than a first threshold, an access terminal (AT) checks errors by decoding a current packet. If no errors are found, termination of retransmission of the current packet is requested. If errors are found, retransmission of the current packet is requested. If the reception power is less than a second threshold, transmission of the current packet is given up or an access network (AN) is requested to retransmit the current packet from the beginning. If the reception power is less than or equal to the first threshold and greater than or equal to the second threshold, retransmission of the current packet is requested.

Therefore, channel throughput is increased, the power required for decoding and error checking is reduced, and the decrease of feedback time reduces the required capacity of a memory in a transmitter.

[REPRESENTATIVE FIGURE]

FIGURE 5

[INDEX]

Link adaptation, ARQ, hybrid ARQ, C/I

[SPECIFICATION]

[TITLE OF THE INVENTION]

METHOD AND APPARATUS FOR REQUESTING SELECTIVE PACKET RETRANMSISSION IN MOBILE TELECOMMUNICATION SYSTEM

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 illustrates a time slot transmitting and receiving relationship between HDR forward and reverse links according to the prior art;

FIG. 2 is a flowchart illustrating a packet retransmission requesting procedure in a conventional HDR system;

FIG. 3 illustrates packet transmission according to HDR forward data rates;

FIG. 4 illustrates a flowchart illustrating a packet retransmission requesting procedure in a conventional hybrid ARQ system;

FIG. 5 is a flowchart illustrating a packet retransmission request operation in an HDR system according to an embodiment of the present invention;

FIG. 6 illustrates a slot transmitting and receiving relationship between HDR forward and reverse links according to the embodiment of the present invention;

FIG. 7 is a block diagram of a transmitter in an HDR AT according to the embodiment of the present invention; and

FIG. 8 is a flowchart illustrating a packet retransmission request operation in a hybrid ARQ system according to another embodiment of the present invention.

[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]

[OBJECT OF THE INVENTION]

[RELATED FIELD AND PRIOR ART OF THE INVENTION]

The present invention relates generally to a method for adapting a mobile telecommunication system to channel conditions, and in particular, to a method and apparatus for selectively requesting retransmission of packets in both a link adaptation scheme and an ARQ (Automatic Repeat reQuest) scheme.

In a radio channel used in a mobile telecommunication system, as a result of attenuation variations along a propagation path, severe inter-system interference, and fading according to a path distance and shadowing, the carrier-to-interference ratio (C/I) of the radio channel is significantly changed depending on channel conditions. Link adaptation is a scheme of adapting a data rate to channel conditions including reception C/I in order to increase channel throughput. In the link adaptation scheme, the data rate is determined according to a code rate and a modulation. A link adaptation system increases a data rate by means of high code rate codes and high-level modulation when a reception C/I is high. If the reception C/I is low, the link adaptation system decreases the data rate by means of low code rate codes and low level modulation and retransmits packets selectively to thereby increase channel reliability.

In an HDR (High data Rate) system standardized by the 3GPP2 (3rd Generation Partnership Project 2), physical layers using link adaptation on the forward link can be transmitted in 13 ways according to three modulation schemes, QPSK (Quadrature Phase Shift Keying), 8PSK (8-ary Phase Shift Keying), and 16QAM (16-ary Quadrature Amplitude Modulation), three code rates, 1/4, 3/8 and 1/2, and the number of slots in which a packet is repeatedly transmitted.

FIG. 1 illustrates a time slot transmitting and receiving relationship between HDR forward and reverse links. Referring to FIG. 1, an HDR packet includes 2048 chips per slot and a pilot channel in each half slot is assigned to 96

chips. Since the pilot channel is transmitted with the same power as that of a traffic channel, the C/I of the pilot channel is equal to that of the traffic channel. The pilot C/I becomes a criterion by which a code rate and modulation are determined.

FIG. 2 is a flowchart illustrating a packet transmission requesting procedure in a conventional HDR system.

Referring to FIG. 2, upon receipt of a packet in each slot, an AT analyses the preamble of the packet, checks whether the packet is destined for the AT, and if it is, checks whether an AN transmitted the packet at a data rate requested by the AT by detecting the length of the preamble in step S110. The AT measures the reception C/I of a pilot signal in the packet in step S120 and determines a data rate corresponding to the reception C/I in step S130. The AT feeds back information about the determined data rate in step S140. Here, the data rate information is called DRC (Data Rate Control) information, which is transmitted in each slot on a reverse DRC channel as shown in FIG. 1.

If the determined data rate is low, the AN transmits the packet repeatedly to ensure channel reliability. FIG. 3 illustrates packet lengths versus data rates on the HDR forward link. Referring to FIG. 3, the same packet is transmitted 16 times at 38.4kbps and 8 times at 76.8kbps. The packet is transmitted once at a high data rate of from 614.4 through 2457.6kbps.

The repeated transmission of one packet results in the increase of channel estimation errors, slow adaptation of a code rate and modulation to channel changes, and dissipation of radio resources because one packet occupies a long slot period. In addition, since the HDR forward link is subject to TDM (Time Division Multiplexing) between users, if the users occupy many time slots

at low data rates, the overall throughput is reduced.

On the other hand, in the case of ARQ, the AT performs a CRC (Cyclic Redundancy Code) check on a received packet and requests packet retransmission to the AN only if the packet has errors. Therefore, a data rate is virtually decreased and channel reliability is increased. In an advanced hybrid ARQ scheme, packet reliability is further increased by reducing a code rate in packet retransmission using error correction codes or by decoding packets of the same sequence number in combination.

Now 1Xtreme-based hybrid ARQ proposed by the 3GPP2 will be described.

FIG. 4 is a flowchart illustrating a packet retransmission requesting procedure in a conventional hybrid ARQ system.

Referring to FIG. 4, an AT receives a packet in step S210 and accumulates packet symbols by combining the received packet with previously received packets of the same sequence number in step S220. The AT decodes the packet symbols and performs a CRC check in step S230 and determines whether CRC errors exist in step S240. If no CRC errors are found, the AT transmits an ACK (Acknowledgment) signal to an AN and the decoded data to an upper layer in step S250. The decoded data is processed in the upper layer and the accumulated symbols are discarded in step S260. On the other hand, if CRC errors are found, the AT requests retransmission of the same packet to the AN in step S245.

As described above, the CRC check is performed after decoding a received packet in ARQ. If a channel condition is very bad, errors will be

detected continuously in the CRC check and retransmission will be requested continuously. Therefore, much power is dissipated for repeated decoding and a feedback delay is prolonged as much time as required for the decoding. This implies that the AT needs a memory of capacity large enough to store many packets.

Link adaptation and ARQ increase channel throughput by adapting a transmission scheme and the number of transmission times to channel conditions. Yet, the former may decrease the throughput by repeated packet transmission, whereas the latter has the problems of power dissipation, increased delay time, and the requirement of a large capacity memory.

[SUBSTANTIAL MATTER OF THE INVENTION]

An object of the present invention is, therefore, to provide a method for increasing a channel adaptation speed and as a result, increasing throughput both a link adaptation and an ARQ mobile telecommunication system.

Another object of the present invention is to provide a method for checking packet errors after determining whether decoding should be performed or not in link adaptation and ARQ.

A further object of the present invention is to provide a method for determining whether a packet is to be retransmitted according to a reception power measurement in link adaptation and ARQ.

Still another object of the present invention is to provide a method for determining whether a packet is to be decoded according to a reception power measurement in link adaptation and ARQ.

According to an aspect of the present invention, there is provided a method of selectively requesting retransmission of a packet in a mobile telecommunication system, comprising the steps of comparing the reception power of a forward pilot signal with a predetermined first threshold by an access terminal (AT), and requesting termination of retransmission of a current packet by transmitting an ACK (Acknowledgment) signal to an access network (AN) if the reception power is greater than the first threshold,.

According to another aspect of the present invention, there is provided a method of selectively requesting retransmission of a packet in a mobile telecommunication system, comprising the steps of comparing the reception power of a forward pilot signal with a predetermined first threshold by an access terminal (AT), checking errors by decoding a current packet if the reception power is greater than the first threshold, and requesting termination of retransmission of the current packet by transmitting an ACK signal to an access network (AN) if no errors are found.

According to still another aspect of the present invention, there is provided a method of selectively requesting retransmission of a packet in a mobile telecommunication system, comprising the steps of comparing the reception power of a forward pilot signal with a predetermined threshold by an access terminal (AT), and requesting termination of retransmission of a current by transmitting a NACK signal to an access network (AN) packet if the reception power is less than the threshold.

According to still another aspect of the present invention, there is provided a method of selectively requesting retransmission of a packet in a mobile telecommunication system, comprising the steps of comparing the reception power of a forward pilot signal with a predetermined threshold by an

access terminal (AT), determining a data rate corresponding to the reception power if the reception power is less than or equal to the first threshold, and requesting retransmission of a current packet by transmitting the determined data rate to an access network (AN).

According to a still another aspect of the present invention, there is provided a method of selectively requesting retransmission of a packet in a mobile telecommunication system using an ARQ (Automatic Repeat reQuest) scheme or a hybrid ARQ scheme, comprising the steps of comparing the reception power of a forward pilot signal with a predetermined first threshold by an access terminal (AT), and requesting retransmission of a current packet by transmitting the determined data rate to an access network (AN) if the reception power is equal to or less than the first threshold.

According to a still another aspect of the present invention, there is provided an apparatus for selectively requesting retransmission of a packet in a mobile telecommunication system, comprising a device for comparing the reception power of a forward pilot signal with a predetermined first threshold, and a device for requesting termination of retransmission of a current packet by transmitting an ACK signal to an access network (AN) if the reception power is greater than the first threshold.

According to a still another aspect of the present invention, there is provided an apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system. The apparatus comprises a device for comparing the reception power of a forward pilot signal with a predetermined first threshold, a device for decoding a current packet and checking errors in the decoded packet if the reception power is greater than the first threshold, and a device for requesting termination of retransmission of the

current packet by transmitting an ACK signal to an access network (AN) if no errors are found in the packet.

According to a still another aspect of the present invention, there is provided an apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system, comprising a device for comparing the reception power of a forward pilot signal with a predetermined threshold, and a device for requesting termination of retransmission of a current packet by transmitting a NACK signal to an access network (AN) if the reception power is less than the threshold.

According to a still another aspect of the present invention, there is provided an apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system, comprising a device for comparing the reception power of a forward pilot signal with a predetermined first threshold, and a device for requesting retransmission of a current packet to an access network (AN) if the reception power is less than or equal to the first threshold.

According to a still another aspect of the present invention, there is provided an apparatus for selectively requesting retransmission of a packet in a mobile telecommunication system using a link adaptation scheme. The apparatus comprises a device for measuring the reception power of a forward pilot signal received from an access network (AN), a device for checking whether packets of the same sequence number were received and accumulating the measured reception power of a current packet and the packets of the same sequence number, a device for comparing the accumulated reception power with at least one predetermined threshold, a device for accumulating the traffic symbols of data packets if the data packets have the same sequence number as

that of a forward traffic signal received from the AN, a device for decoding the accumulated traffic symbols according to the comparison result, a device for checking errors in the decoded traffic symbols according to the comparison result, and a device for generating a DRC symbol being data rate information corresponding to the measured reception power, selecting one of signals ACK, NACK, and DRC referring at least one of the comparison result and the error check result, and transmitting the selected signal on a DRC channel on a reverse link.

According to a still another aspect of the present invention, there is provided an apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system using an ARQ (Automatic Repeat reQuest) scheme or a hybrid ARQ scheme. The apparatus comprises a device for comparing the reception power of a forward pilot signal with a predetermined first threshold, and a device for requesting retransmission of a current packet by transmitting the determined data rate to the AN if the reception power is equal to or less than the first threshold.

[CONSTRUCTION AND OPERATION OF THE INVENTION]

Preferred embodiments of the present invention will be described hereinbelow with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

Terms used herein will first be defined.

ACK: a signal requesting discontinuation of retransmission of a packet if a received packet has no errors;

NACK: a signal requesting discontinuation of retransmission of a packet

if errors are sure to be generated in the packet even if it is retransmitted;

Current packet: a packet with a sequence number to be received at the present time; and

Identical packets: packets with the same sequence number.

FIG. 5 is a flowchart illustrating a packet retransmission request operation in an HDR system according to an embodiment of the present invention.

Referring to FIG. 5, upon receipt of a packet in each slot, an AT analyses the preamble of the packet, checks whether the packet is destined for the AT in step S310. If it is, the AT determines the length of the preamble and checks whether the data rate of the packet is a low data rate in step S320. Here, a low data rate is defined as a data rate at which the same packet is transmitted at least twice. In the case of a high data rate without packet retransmission, the AT measures the pilot C/I of the received packet in step S120 and determines a data rate corresponding to the reception C/I in step S130 in the conventional procedure of FIG. 2.

In the case of a low data rate (repeated packet transmission), the AT measures the reception power of a forward pilot channel or a forward pilot symbol in the time period of the current packet in step S330. Reception C/I is used as reception power in the present invention. If the pilot C/I of the current packet has already been measured, in other words, if the current packet was received previously, the AT calculates the accumulated pilot C/I of the same packets.

In step S340, the AT compares the measured pilot C/I or the accumulated pilot C/I with a predetermined first threshold. The first threshold is a value that

ensures a packet error rate below a predetermined value after packet decoding. The first threshold can be calculated by accumulating a C/I corresponding to the data rate of the current packet as many times as the maximum number of packet transmissions. The AT searches for a C/I corresponding to the current data rate in a C/I table listing C/I requirements versus data rates and determines the first threshold utilizing the C/I. Table 1 shown below illustrates C/I values required for data rates, and the resulting first thresholds.

(Table 1)

Data rate	Required C/I	Packet repetition	First threshold
38.4 kbps	–12.0 dB	16	0 dB
76.8 kbps	–9.0 dB	8	0 dB
102.4 kbps	–7.8 dB	6	0 dB
153.6 kbps	–6.0 dB	4	0 dB
204.8 kbps	–4.8 dB	3	0 dB
307.2 kbps	–3.0 dB	2	0 dB
614.4 kbps	0.0 dB	1	0 dB
921.6 kbps	2.0 dB	1	2 dB
1228.8 kbps	4.0 dB	1	4 dB
1843.2 kbps	7.0 dB	1	7 dB
2457.6 kbps	10.0 dB	1	10 dB

If the pilot C/I is greater than the first threshold, the AT decodes the current packet and performs an error check in step S350. The error check can be performed in many ways. In the present invention, a CRC error checks is performed.

If no errors are found in the CRC check in step S360, the AT transmits an ACK signal to the AN and the packet to an upper layer in step S370. Upon

receipt of the ACK signal, the AN discontinues retransmission of the packet and initiates transmission of the next packet. On the other hand, if errors are found in the CRC check in step S360, the AT determines a data rate corresponding to the pilot C/I in step 362 and transmits DRC information indicating the determined data rate to the AN in step S364. Upon receipt of the DRC information, the AN retransmits the packet at the requested data rate.

If the pilot C/I is equal to or less than the first threshold, the AT compares the pilot C/I with a predetermined second threshold in step S342. The second threshold is a pilot C/I or an accumulated pilot C/I with which packet errors are sure to exist even if the current packet is repeatedly transmitted a total slot number of times.

If the pilot C/I is less than the second threshold, the AT quits decoding and transmits a NACK signal to the AN to discontinue the retransmission of the current packet in step S344. In this case, the upper layer considers the current packet as an error. Upon receipt of the NACK signal, the AN discontinues the retransmission of the packet, or retransmits the packet from the beginning slot. If the pilot C/I is equal to the second threshold, the AT determines the data rate corresponding to the pilot C/I in step S362 and transmits the DRC information to the AN in step S364. Upon receipt of the DRC information, the AN retransmits the packet at the requested data rate.

The second threshold is calculated by the following equation 1a or 1b.

(Equation 1a)

$$\text{second threshold} = (\text{required C/I} \times \text{maximum number of packet transmissions} - \text{margin}) \times \frac{\text{number of slots transmitted so far for packet}}{\text{maximum number of packet transmissions}}$$

(Equation 1b)

$$\text{second threshold[dB]} = \text{required C/I[dB]} \times \log_{10}(\text{maximum number of packet transmissions}) - \text{margin[dB]} + 10 \times \log_{10}\left(\frac{\text{number of slots transmitted so far for packet}}{\text{maximum number of packet transmissions}}\right)$$

The second threshold is calculated by multiplying a C/I corresponding to a current data rate by the maximum number of packet transmissions, subtracting a predetermined margin from the product, and multiplying the difference by a ratio of the number of already transmitted slots to the total number of slots transmittable for the packet. The second threshold varies with the total number of transmittable slots. The margin is determined according to the reliability of the second threshold. If the reliability of NACK is high, the margin increases and if the reliability of NAK is low, the margin drops.

Now there will be given a description of a second threshold when five slots were transmitted at 76.8kbps. A required C/I is −9.0dB according to Table 1 and a margin is given as 3.0dB. Accumulated as many times as the maximum number of packet occurrences, that is, accumulated eight times, the required C/I is 0.0dB and the required C/I minus the margin is −3.0dB. This value is multiplied by a ratio of the number of already transmitted slots to the total number of transmittable slots for the packet, 5/8(−2.0dB). Then, the second threshold is −5.0dB. Table 2 lists second thresholds versus transmitted slot numbers at 76.8kbps.

(Table 2)

Number of transmitted slots	Second threshold
1	−12.0 dB
2	−9.0 dB
3	−7.2 dB

4	−6.0 dB
5	−5.0 dB
6	−4.2 dB
7	−3.6 dB
8	−3.0 dB

As described above, the AT transmits one of DRC, ACK, and NACK to the AN on the DRC channel according to the pilot C/I comparison result and the CRC check result.

Table 3 illustrates information examples transmitted on the DRC channel according to the embodiment of the present invention.

(Table 3)

DRC symbol	Information
0000	38.4 kbps
0001	76.8 kbps
0010	102.4 kbps
0011	153.6 kbps (short)
0100	153.6 kbps (long)
0101	204.8 kbps
0110	307.2 kbps (short)
0111	307.2 kbps (long)
1000	614.4 kbps
1001	921.6 kbps
1010	1228.8 kbps
1011	1843.2 kbps
1100	2457.6 kbps

1101	ACK
1110	not used
1111	NACK

Referring to Table 3, values 0000 to 1100 of the 4-bit DRC symbol indicate data rates, 1101 indicates ACK, and 1111 indicates NACK. Short and long in 153.6 kbps and 307.2 kbps indicate a short packet and a long packet, respectively.

FIG. 6 illustrates the relationship in slot transmission/reception between the forward link and the reverse link in the HDR system according to the embodiment of the present invention. In FIG. 6, the AN repeatedly transmits a packet in slots on the forward link (AN Tx). Upon receipt of each slot, the AT feeds back one of DRC, ACK, and NACK on the reverse DRC channel (AT Tx).

FIG. 7 is a block diagram of a transmitter in an HDR AT according to the embodiment of the present invention.

Referring to FIG. 7, a C/I measurer 110 measures the C/I of a pilot channel or a pilot symbol received from an AN. A C/I accumulator 120 determines whether the same packet was received previously and accumulates the pilot C/I values of the packets if the same packet exists. A C/I comparator 130 compares the accumulated pilot C/I with a first threshold and a second threshold, respectively and transmits the comparison results to a DRC controller 170. The DRC controller 170 determines a data rate corresponding to the measured pilot C/I and generates a DRC symbol representative of the data rate.

A traffic symbol accumulator 140 accumulates the traffic symbols of the same packets and a decoder 150 decodes the accumulated traffic symbols only if

the accumulated pilot C/I is greater than the first threshold. A CRC checker 160 performs a CRC check on the decoded traffic symbols and transmits the check result to the DRC controller 170.

The DRC controller 170 selects one of ACK, NACK, and a DRC symbol from a memory 180 based on the C/I comparison results and CRC check result and transmits the selected signal on a reverse DRC channel. The memory 180 stores information shown in Table 1 to be transmitted on the DRC channel.

In another example of the first embodiment of the present invention, if the accuracy of reception power measurement (i.e., reception C/I measurement) is maintained within a predetermined range, the ACK signal can be transmitted directly without the CRC check. That is, the AT compares the reception power of a forward pilot signal with the first threshold and if the reception power is greater than the first threshold, it transmits the ACK signal directly to the AN.

It can be further contemplated that if the reception power is equal to or less than the first threshold, it requests packet retransmission to the AN.

The AT can compare the reception power with the second threshold before comparing it with the first threshold and if the reception power is less than the second threshold, the AT can transmit the NACK signal directly to the AN.

FIG 8 is a flowchart illustrating a packet retransmission requesting procedure in a hybrid ARQ system according to another embodiment of the present invention.

Referring to FIG. 8, upon receipt of a packet from an AN in step S410, an AT measures the C/I of a pilot channel in the time period when the packet is

transmitted (hereinafter, referred to as the current packet period). If the measured pilot C/I of the same packet exists, the AT accumulates the pilot C/I of the current packet to the existing pilot C/I in step S420. In step S430, if the same packet was received previously, the AT accumulates the traffic symbols of the same packets in steps S430. In the case of non-hybrid ARQ, the traffic symbols are not accumulated in step S430.

The AT compares the pilot C/I measurement or the accumulated pilot C/I with a predetermined first threshold in step S440. The first threshold is calculated by accumulating a C/I corresponding to the data rate of the current packet as many times as the maximum number of packet occurrences. If the pilot C/I is greater than the first threshold, the AT decodes the accumulated traffic symbols and performs a CRC check on the decoded traffic symbols in step S450.

If no errors are found in the CRC check in step S460, the AT feeds back the ACK signal to the AN so that the AN discontinues retransmission of the current packet in step S470. The AT transmits the current packet to an upper layer and discards the decoded data and the pilot C/I in step S480. If errors are found in the CRC check in step S460, the AT transmits a signal requesting retransmission of the current packet to the AN in step S462.

On the other hand, if the pilot C/I is equal to or less than the first threshold, the AT compares the pilot C/I with a predetermined second threshold in step S442. The second threshold is a value at which packet errors are sure to be generated even if the current packet is transmitted as many times as allowed for the packet. The second threshold varies with the maximum number of packet occurrences. In the ARQ system, the second threshold is calculated by multiplying a C/I corresponding to the current data rate by the maximum number of packet transmissions, subtracting a predetermined margin from the product,

and multiplying the difference by a ratio of the number of already transmitted slots to the total number of slots transmittable for the packet.

If the pilot C/I is less than the second threshold, the AT transmits the NACK signal to the AN in step S446. Upon receipt of the NACK signal, the AN initiates transmitting the packet from the beginning slot, or gives up retransmission of the packet and allocates the resources assigned for the packet to another user. If the pilot C/I is equal to the second threshold, the AT transmits the signal requesting retransmission of the packet to the AN in step S462.

In the second embodiment of the present invention as described above, if the received pilot C/I is greater than the first threshold and CRC errors are found, and if the received pilot C/I is equal to or less than the first threshold and greater than a second threshold, the AT transmits the retransmission request signal to the AN.

Modifications can be made to the second embodiment. If the accuracy of reception power measurement is maintained within a predetermined range, the ACK signal can be transmitted directly without the CRC check. The AT compares the reception power of a forward pilot signal with the first threshold and if the reception power is greater than the first threshold, it transmits the ACK signal directly to the AN.

If the reception power is equal to or less than the first threshold, it requests packet retransmission to the AN.

The AT can compare the reception power with the second threshold before comparing it with the first threshold and if the reception power is less than the second threshold, the AT can transmit the NACK signal directly to the AN.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

[EFFECTS OF THE INVENTION]

The present invention has the following advantages: (1) unnecessary decoding and CRC check can be omitted by performing decoding and a CRC check according to a reception power measurement in both a link adaptation system and an ARQ system. Therefore, channel throughput is increased, the power required for decoding is reduced, and the decrease of feedback time reduces the required capacity of a memory in a transmitter; and (2) unnecessary packet retransmission is prevented by estimating reception link conditions and transmitting the ACK or NACK signal according to the reception power measurement.

[PATENT CLAIMS]

1. A method of selectively requesting retransmission of a packet in a mobile telecommunication system, the method comprising the steps of:

comparing the reception power of a forward pilot signal with a predetermined first threshold by an access terminal (AT); and

requesting termination of retransmission of a current packet by transmitting an ACK (Acknowledgment) signal to an access network (AN) if the reception power is greater than the first threshold,.

2. The method of claim 1, further comprising the steps of:

determining a data rate corresponding to the reception power if the reception power is less than or equal to the first threshold; and

requesting retransmission of the current packet by transmitting the determined data rate to the AN.

3. The method of claim 1, further comprising the steps of:

comparing the reception power with a predetermined second threshold if the reception power is less than or equal to the first threshold; and

requesting termination of retransmission of the current packet by transmitting a NACK signal to the AN if the reception power is less than the second threshold.

4. The method of claim 1, further comprising the steps of:

determining a data rate corresponding to the reception power if the reception power is greater than or equal to the second threshold; and

requesting retransmission of the packet by transmitting the determined data rate to the AN.

5. The method of any of claims 1 to 4, further comprising the step of determining that current packet has no errors by the AN upon receiving the ACK signal.

6. The method of claim 3 or 4, further comprising the step of determining that current packet has errors by the AN upon receiving the ACK signal.

7. The method of any of claims 1 to 4, wherein the first threshold is calculated by accumulating a reception power value corresponding to the data rate of the current packet as many times of the number of packet occurrences.

8. The method of claim 3 or 4, wherein the second threshold is calculated by multiplying a reception power value corresponding to the data rate of the current packet by the number of packet occurrences, subtracting a predetermined margin from the multiplication result, and multiplying the difference by a ratio of the number of packet occurrences until the current time to the maximum number of packet occurrences that can take place.

9. A method of selectively requesting retransmission of a packet in a mobile telecommunication system, the method comprising the steps of:

comparing the reception power of a forward pilot signal with a predetermined first threshold by an access terminal (AT);

checking errors by decoding a current packet if the reception power is greater than the first threshold; and

requesting termination of retransmission of the current packet by transmitting an ACK signal to an access network (AN) if no errors are found.

10. The method of claim 9, further comprising the steps of:

determining a data rate corresponding to the reception power if errors are found; and

requesting retransmission of the current packet by transmitting the determined data rate to the AN.

11. The method of claim 9, further comprising the steps of:

determining the data rate corresponding to the reception power if the reception power is equal to or less than the first threshold; and

requesting retransmission of the current packet by transmitting the determined data rate to the AN.

12. The method of claim 9, further comprising the steps of:

comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold; and

requesting termination of retransmission of the current packet by transmitting a NACK signal to the AN if the reception power is less than the second threshold.

13. The method of claim 12, further comprising the steps of:

determining the data rate corresponding to the reception power if the reception power is equal to or greater than the second threshold; and

requesting retransmission of the current packet by transmitting the determined data rate to the AN.

14. A method of selectively requesting retransmission of a packet in a mobile telecommunication system, the method comprising the steps of:

comparing the reception power of a forward pilot signal with a predetermined threshold by an access terminal (AT); and

requesting termination of retransmission of a current by transmitting a

NACK signal to an access network (AN) packet if the reception power is less than the threshold.

15. A method of selectively requesting retransmission of a packet in a mobile telecommunication system, the method comprising the steps of:

comparing the reception power of a forward pilot signal with a predetermined threshold by an access terminal (AT);

determining a data rate corresponding to the reception power if the reception power is less than or equal to the first threshold; and

requesting retransmission of a current packet by transmitting the determined data rate to an access network (AN).

16. The method of claim 15, further comprising the steps of:

comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold;

determining the data rate corresponding to the reception power if the reception power is equal to or greater than the second threshold; and

requesting retransmission of the current packet by transmitting the determined data rate to the AN.

17. A method of selectively requesting retransmission of a packet in a mobile telecommunication system using an ARQ (Automatic Repeat reQuest) scheme or a hybrid ARQ scheme, the method comprising the steps of:

comparing the reception power of a forward pilot signal with a predetermined first threshold by an access terminal (AT); and

requesting retransmission of a current packet by transmitting the determined data rate to an access network (AN) if the reception power is equal to or less than the first threshold.

18. The method of claim 17, further comprising the steps of:

comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold; and

requesting retransmission of the packet to the AN if the reception power is equal to or greater than the second threshold.

19. An apparatus for selectively requesting retransmission of a packet in a mobile telecommunication system, comprising:

a device for comparing the reception power of a forward pilot signal with a predetermined first threshold; and

a device for requesting termination of retransmission of a current packet by transmitting an ACK signal to an access network (AN) if the reception power is greater than the first threshold.

20. The apparatus of claim 19, further comprising:

a device for determining a data rate corresponding to the reception power if the reception power is equal to or less than the first threshold; and

a device for requesting retransmission of the current packet by transmitting the determined data rate to the AN.

21. The apparatus of claim 19, further comprising:

a device for comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold; and

a device for requesting termination of retransmission of the current packet by transmitting a NACK signal to the AN if the reception power is less than the second threshold.

22. The apparatus of claim 21, further comprising:

a device for determining a data rate corresponding to the reception power

if the reception power is equal to or greater than the second threshold; and

a device for requesting retransmission of the current packet by transmitting the determined data rate to the AN.

23. The apparatus of any of claims 19 to 22, wherein the first threshold is calculated by accumulating a reception power value corresponding to the data rate of the current packet as many times of the number of packet occurrences.

24. The apparatus of claim 21 or 22, wherein the second threshold is calculated by multiplying a reception power value corresponding to the data rate of the data packet by the number of packet occurrences, subtracting a predetermined margin from the multiplication result, and multiplying the difference by a ratio of the number of packet occurrences until the current time to the maximum number of packet occurrences that can take place.

25. An apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system, the apparatus comprising:

a device for comparing the reception power of a forward pilot signal with a predetermined first threshold;

a device for decoding a current packet and checking errors in the decoded packet if the reception power is greater than the first threshold; and

a device for requesting termination of retransmission of the current packet by transmitting an ACK signal to an access network (AN) if no errors are found in the packet.

26. The apparatus of claim 25, further comprising:

a device for determining a data rate corresponding to the reception power

if errors are found in the decoded packet; and

a device for requesting retransmission of the current packet by transmitting the determined data rate to the AN.

27. The apparatus of claim 26, further comprising:

a device for determining the data rate corresponding to the reception power if the reception power is equal to or less than the first threshold; and

a device for requesting retransmission of the current packet by transmitting the determined data rate to the AN.

28. The apparatus of claim 26, further comprising:

a device for comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold; and

a device for requesting termination of retransmission of the current packet by transmitting a NACK signal to the AN if the reception power is less than the second threshold.

29. The apparatus of claim 28, further comprising:

a device for determining the data rate corresponding to the reception power if the reception power is equal to or greater than the second threshold; and

a device for requesting retransmission of the packet by transmitting the determined data rate to the AN.

30. An apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system, the apparatus comprising:

a device for comparing the reception power of a forward pilot signal with a predetermined threshold; and

a device for requesting termination of retransmission of a current packet

by transmitting a NACK signal to an access network (AN) if the reception power is less than the threshold.

31. An apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system, the apparatus comprising:

a device for comparing the reception power of a forward pilot signal with a predetermined threshold;

a device for determining a data rate corresponding to the reception power if the reception power is less than or equal to the first threshold; and

a device for requesting retransmission of a current packet to the AN by transmitting the determined data rate to an access network (AN).

32. The apparatus of claim 31, further comprising:

a device for comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold;

a device for determining the data rate corresponding to the reception power if the reception power is equal to or greater than the second threshold; and

a device for requesting retransmission of the current packet by transmitting the determined data rate to the AN.

33. An apparatus for selectively requesting retransmission of a packet in an access terminal (AT) of a mobile telecommunication system using an ARQ (Automatic Repeat reQuest) scheme or a hybrid ARQ scheme, the apparatus comprising:

a device for comparing the reception power of a forward pilot signal with a predetermined first threshold; and

a device for requesting retransmission of a current packet by transmitting the determined data rate to the AN if the reception power is equal to or less than

the first threshold.

34. The apparatus of claim 33, further comprising:

a device for comparing the reception power with a predetermined second threshold if the reception power is equal to or less than the first threshold; and

a device for requesting retransmission of the current packet to the AN if the reception power is equal to or greater than the second threshold.

35. An apparatus for selectively requesting retransmission of a packet in a mobile telecommunication system using a link adaptation scheme, the apparatus comprising:

a device for measuring the reception power of a forward pilot signal received from an access network (AN);

a device for checking whether packets of the same sequence number were received and accumulating the measured reception power of a current packet and the packets of the same sequence number;

a device for comparing the accumulated reception power with at least one predetermined threshold;

a device for accumulating the traffic symbols of data packets if the data packets have the same sequence number as that of a forward traffic signal received from the AN;

a device for decoding the accumulated traffic symbols according to the comparison result;

a device for checking errors in the decoded traffic symbols according to the comparison result; and

a device for generating a DRC symbol being data rate information corresponding to the measured reception power, selecting one of signals ACK, NACK, and DRC referring at least one of the comparison result and the error check result, and transmitting the selected signal on a DRC channel on a reverse